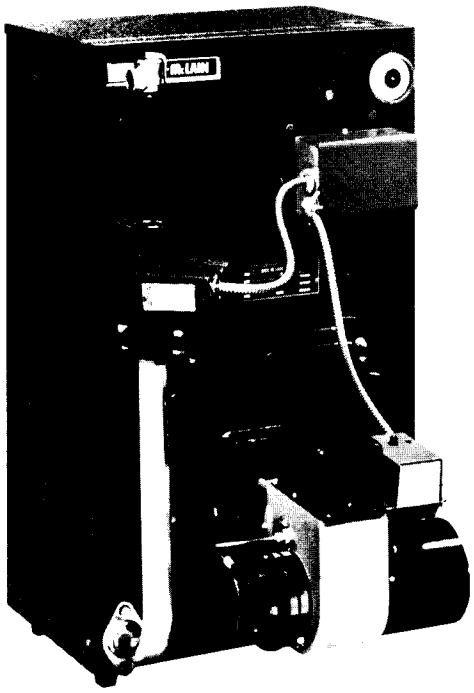
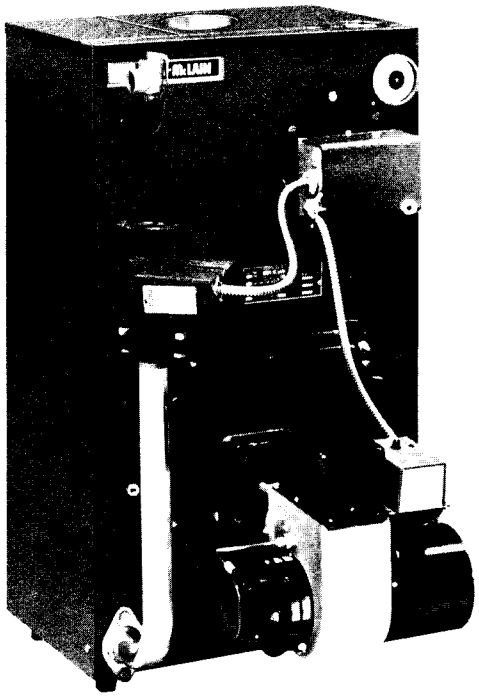
WEIL-McLAIN

68 and 68V Oil-Fired Boiler Manual



68 BOILER
REAR FLUE OUTLET

Includes:
- Installation
- Start-up
- Service
- Parts



68V BOILER
TOP FLUE OUTLET

READ ALL INSTRUCTIONS BEFORE INSTALLING

To the owner: Installation and service should be performed by qualified contractor.

To the installer: Leave all instructions with boiler for future reference.

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Part No. 550-110-494/0487WP

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IMPORTANT: When calling or writing about the boiler, PLEASE GIVE THE MODEL, SERIES, AND C.P. NUMBER, located on the boiler nameplate.

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WARNING

DO NOT USE PETROLEUM–BASED CLEANING OR SEALING COMPOUNDS IN BOILER SYSTEM. SEVERE DAMAGE TO THE BOILER WILL OCCUR.

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

DANGER indicates presence of a hazard which *will* cause *severe* personal injury, death or substantial property damage if ignored.

WARNING indicates the presence of a hazard which *can* cause *severe* personal injury, death or substantial property damage if ignored.

CAUTION indicates presence of a hazard which *will* or *can* cause minor personal injury or property damage if ignored.

NOTICE indicates special instructions on installations, operation, or maintenance which are important but not related to personal injury hazards.

WARNING

FAILURE TO FOLLOW ALL INSTRUCTIONS IN PROPER ORDER CAN CAUSE PERSONAL INJURY OR DEATH. READ ALL INSTRUCTIONS BEFORE INSTALLING.

Section I: Pre-Installation

CODES

Installations must comply with all local codes, laws, regulations and ordinances. When required, the installations must conform to American Society of Mechanical Engineers Safety Devices for Automatically Fired Boilers, No. CSD-1.

AIR SUPPLY FOR COMBUSTION

WARNING Adequate combustion and ventilation air must be provided to assure proper combustion and prevent the possibility of flue gas spillage.

Exhaust fan must not be used in boiler area.

1. In buildings of conventional frame, masonry or metal construction, infiltration is normally adequate to provide combustion air for boilers in unconfined rooms.
2. If the space is in a building of unusually tight construction, air should be obtained from outdoors or from spaces which freely connect with outdoors (see 4 below).
3. For boilers in confined rooms, two permanent openings shall be provided: one within 12 inches from the ceiling and one within 12 inches from the floor of the room. Each opening shall be at least one square inch per 1,000 BTUH (140 sq. in. per 1 GPH) boiler input, but must not be less than 100 sq. inches. These openings shall freely connect with areas having adequate infiltration from outside.
4. When all air is provided from outdoors the confined space shall be provided with two openings as outlined above. These openings shall connect directly or by ducts with outdoors or spaces (crawl or attic) that freely connect with the outdoors and shall be of the size listed below for that particular arrangement:
   (a) One square inch per 4,000 BTUH (35 sq. in. per 1 GPH) of boiler input for direct outdoor air supply through an outside wall or through vertical ducting directly to outside.
   (b) One square inch per 2,000 BTUH (70 sq. in. per 1 GPH) of boiler input for direct outdoor air through horizontal ducting.
   (c) All ducting shall be of the same size as the opening to which it is connected with minimum dimensions of no less than 3 × 3 inches or 9 total square inches of area.
   (d) Other size ducting must comply with local codes.
5. For boilers installed in closets, alcoves, undercounters, etc., see pages 6 and 7.

CHIMNEY OR VENT REQUIREMENTS

Designed for NATURAL DRAFT FIRING ONLY. Use a Class A chimney.

Minimum chimney or vent sizes:
Boiler sizes 2–7 — 8" x 8" square (6¾ × 6¾ inside liner) or 8" round
15 feet high

Boiler sizes 8–9 — 12" x 12" square (10⅝ x 10⅝ inside liner) or 12" round
20 feet high

In most cases a chimney or vent extended at least 3 feet above the highest part of the roof or other structure within 30 feet will be sufficient to prevent downdrafts. Increase chimney cross-sectional area and height at least 4 percent for each 1,000 feet above sea level.

WARNING Inspect existing chimney or vent before installing new boiler. Failure to remove blockage, clean, or replace damaged pipe can cause severe injury or death.

An induced draft fan may be necessary if:
1) Excessive resistance to flow of combustion gases can be expected.
2) Cross-section area of chimney is smaller than minimum recommended.
3) Chimney height is less than recommended.

If an induced draft fan is used, overfire draft should not exceed – .02 inches water column.

SELECT THE BOILER LOCATION

CONSIDER ALL CONNECTIONS TO THE BOILER BEFORE SELECTING A LOCATION.

WARNING To avoid personal injury, death or property damage, keep boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids.

STANDARD MINIMUM CLEARANCES

24 inches—front and top
6 inches—Flue pipe to combustible materials.
6 inches—Right and left sides (except steam with tankless heater)
15 inches—Left side for steam with tankless heater.
6 inches—Back (top outlet)

SPECIAL CLOSE CLEARANCES—See Pages 6 and 7.

RESIDENTIAL GARAGE INSTALLATION

WARNING Install boiler so burner is at least 18 inches above the floor.

BOILER FOUNDATION

Boiler may be installed on non-carpeted combustible flooring. Boiler legs provide approximately one inch air space for natural aeration.

Boiler must be installed on level surface. If non-level conditions exist or if area could flood, build LEVEL concrete or solid brick foundation. See Figure 1 and Table I.

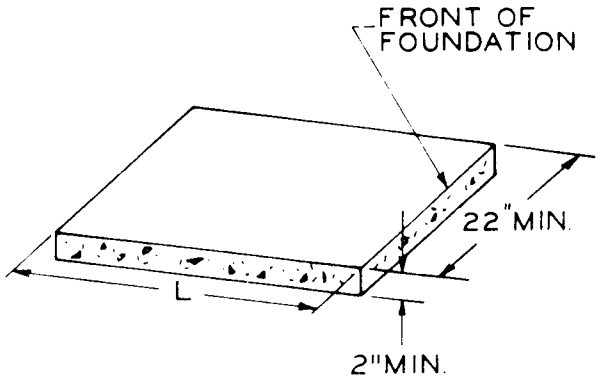


FIGURE 1

TABLE I BOILER FOUNDATION SIZES		
L = Length of Foundation		
Boiler Size	**Packaged Water Only**	**All Other Boilers**
268	12½"	—
368	15½"	15½"
468	15½"	18½"
568	18½"	21½"
668	21½"	24½"
768	24½"	27½"
868	—	30½"
968	—	33½"

Section II: Installing Boiler

PLACEMENT

Position boiler close to chimney. Provide minimum clearances as indicated.

NOTICE **When transporting with crate removed, do not tip boiler forward. Damage to burner may result.**

For 8 and 9-section blocks:

1. To split block:
   a. Remove cleanout plate.
   b. Remove (3) 5½" tie rods.
   c. Pull block apart. Save rods, nuts, washers, elastomer seals, and cope seal.
2. Move divided block to location.
3. Reassemble:
   a. Clean port openings with dry rag. DO NOT USE OIL. Place elastomer seals in port openings.
   b. Re-form cope seal and place in sealing groove.
   c. Draw sections together evenly until metal-to-metal contact is made at nipple ports.
   d. Replace cleanout plate.

HYDROSTATIC PRESSURE TEST

Pressure test BEFORE attaching piping or electrical supply. Install, but do not hook up, tankless heater (if used).

CAUTION DO NOT pressure test with water level control installed. Damage to control can occur.

1. Remove shipping nipple.
2. Install drain valve.
3. Install valve at highest tapping to vent air.
4. Connect water supply.
5. Plug remaining tappings.
6. Fill boiler. Vent all air. Test at 1½ times working pressure for more than 10 minutes.

WARNING DO NOT LEAVE BOILER UNATTENDED. Cold water fill could expand and cause excess pressure.

7. Check for maintained gauge pressure.
8. Check for leaks. Repair if found.

CAUTION Repair leaks at once. Damage to boiler can result. NEVER use petroleum-based stop leak compounds. Seal damage and leakage between sections will occur.

9. Drain boiler and remove testing plugs.
10. On initial start-up, check for leaks in system piping. If found, repair at once.

TABLE II CONTROL TAPPINGS

LOCATION	SIZE	WATER	STEAM
C	3/4"	Drain	Drain
D (in plate)	1 1/2"	High-Limit Control (bushed to 3/4")	Skim Tapping
D (in water heater)	3/4"	Combination High-Limit and Operating Control	—
H	1/4"	Combination Pressure and Temperature Gauge	Pressure Gauge and Pressure Limit Control
K_1	3/4"	Water Relief Valve	Gauge Glass and/or Low-Water Cutoff (bushed to 1/2")
K_2	3/4"	Plugged	Gauge Glass and/or Low-Water Cutoff (bushed to 1/2")
N	3/4"	To Compression Tank	Steam Relief Valve
U_1 (in steam heater)	3/4"	—	Heater Operating Control (368 through 568 Boilers)
U_2	3/4"	Plugged	Heater Operating Control (668–968 Boilers)

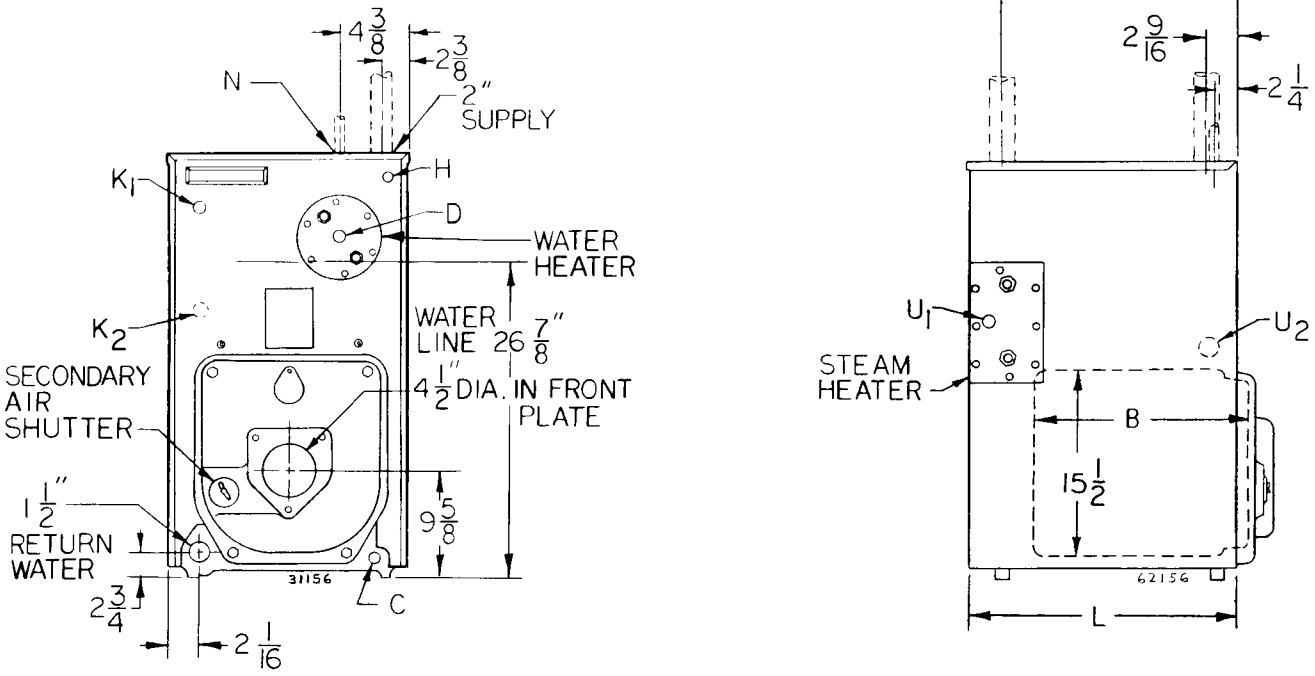


FIGURE 2

JACKET ASSEMBLY
(For non-packaged boilers)

Refer to jacket erecting instructions packed in the jacket carton.

BREECHING ERECTION

Back outlet (68)—see Figure 3.
Top outlet (68V)—see Figure 4.

Use full-sized breeching (P-268 can be reduced to 5 inches). See page 3 for chimney size.

Connection must be above bottom of chimney to avoid blockage. Breeching must not enter chimney far enough to cause obstruction. Use a thimble or slip joint where breeching enters the chimney to allow removal for cleaning.

CAUTION Avoid long horizontal breechings, excessive numbers of elbows or tees, or other obstructions restricting flow of combustion gases.

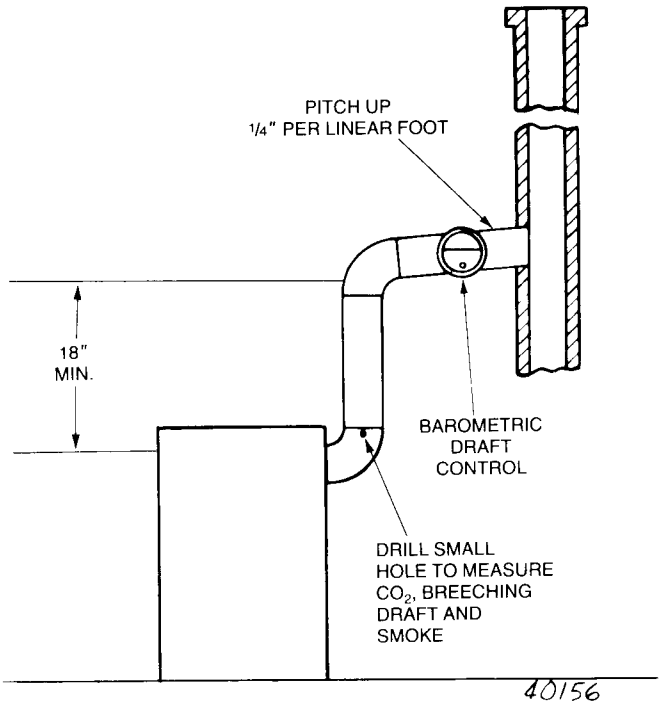


FIGURE 3
68 BREECHING CONNECTION

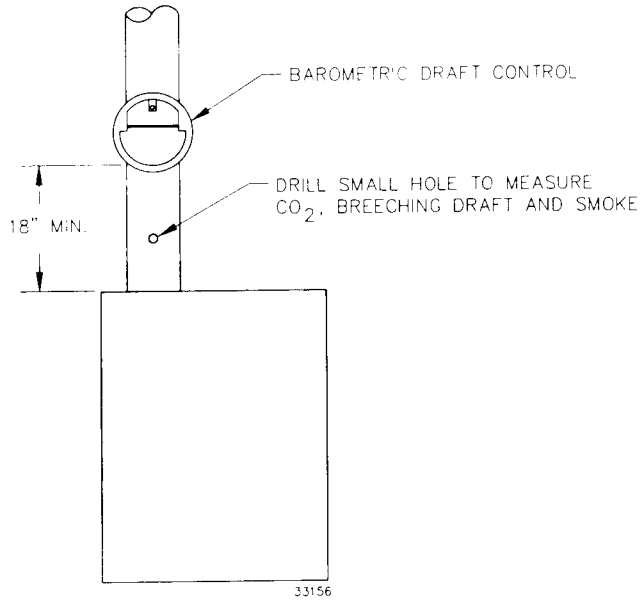


FIGURE 4
68V BREECHING CONNECTION

Section III: Close Clearance Installation

Water boilers can be located in close-clearance areas (such as alcove, closet, under counters, etc.) only when all instructions in this section are followed. Substitute these instructions for corresponding material in manual. All other procedures and practices must remain the same.

Standard minimum clearances (shown on page 4) should be used where possible. Where closer clearances are required:

Top of boiler—if less than 24" are available, provide removable surface to allow for cleaning boiler flueways. Distance between combustible surface and boiler can be no less than 2 inches.
Right and/or left side—2 inches minimum.
Front of boiler—2 inches minimum from burner.
Double-wall flue pipe to combustible surface—as listed in Table III and Figures 7 and 8 or 9.

NOTICE Flue pipe clearances must take precedence over jacket clearances.

1. Install boiler using clearances listed.
2. Install barometric control 18–20 inches from boiler in breeching.
3. Obtain and use kit, part no. 386-500-050.
   a. Attach manual reset temperature switch near upper surface of enclosed area. See Figure 5.
   b. Install switch leads to burner primary control. See Figure 6.
4. Provide two fresh air openings when installing in confined space. Size each opening one square inch per 1,000 BTU (140 sq. in. per 1 GPH) input. Locate openings near top and bottom of enclosed space.
5. **WARNING** TO THE HOMEOWNER: If red button on manual reset temperature switch has popped out, CALL YOUR SERVICEMAN IMMEDIATELY.

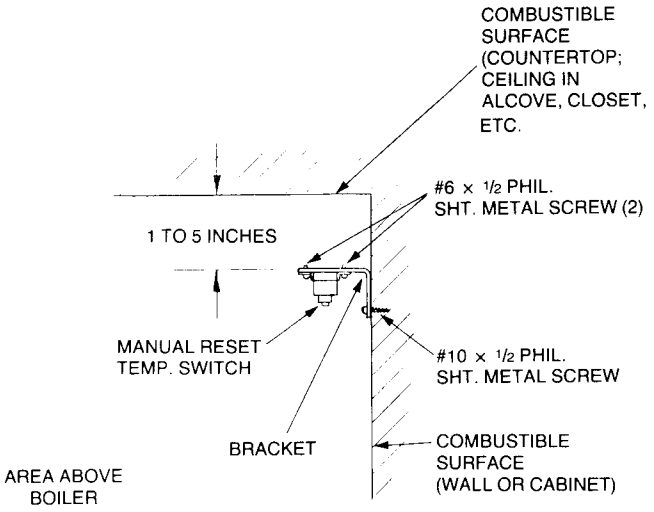
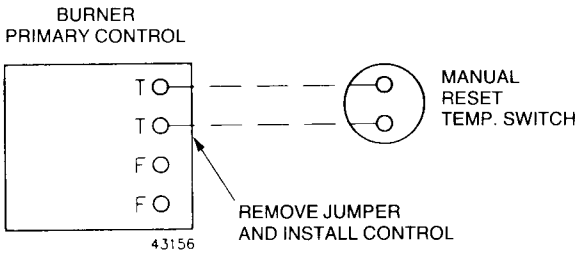

COMBUSTIBLE SURFACE (COUNTERTOP; CEILING IN ALCOVE, CLOSET, ETC.
#6 x 1/2 PHIL. SHT. METAL SCREW (2)
1 TO 5 INCHES
MANUAL RESET TEMP. SWITCH
#10 x 1/2 PHIL. SHT. METAL SCREW
BRACKET
COMBUSTIBLE SURFACE (WALL OR CABINET)
AREA ABOVE BOILER

FIGURE 5



REFER TO WIRING DIAGRAM, PAGE 15.

FIGURE 6

TABLE III PROTECTION REQUIRED FOR CLEARANCES LESS THAN 6 INCHES*

WHEN DESIRED MINIMUM CLEARANCE FROM DOUBLE-WALL VENT PIPE TO COMBUSTIBLE SURFACE IS:	USE THE FOLLOWING PROTECTION**
3"	1/4" insulating millboard*** spaced out 1" ■
3"	28 gage sheet metal on 1/4" insulating millboard***
2"	28 gage sheet metal spaced out 1" ■
2"	28 gage sheet metal on 1/8" insulating millboard*** spaced out 1" ■
2"	22 gage sheet metal on 1" mineral wool bats reinforced with wire or equivalent
4"	1/4" insulating millboard***

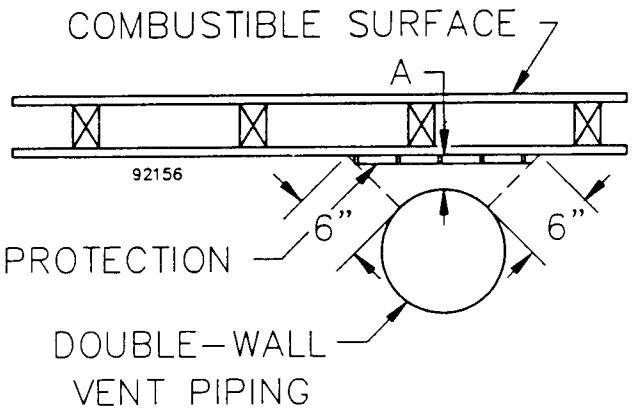
NOTES:

* All clearances measured from outer surface of equipment to combustible surface, not to the protection used.

** Apply to combustible surface unless otherwise noted. Cover all surfaces as specified in Table III and Figure 7. Thicknesses are minimum.

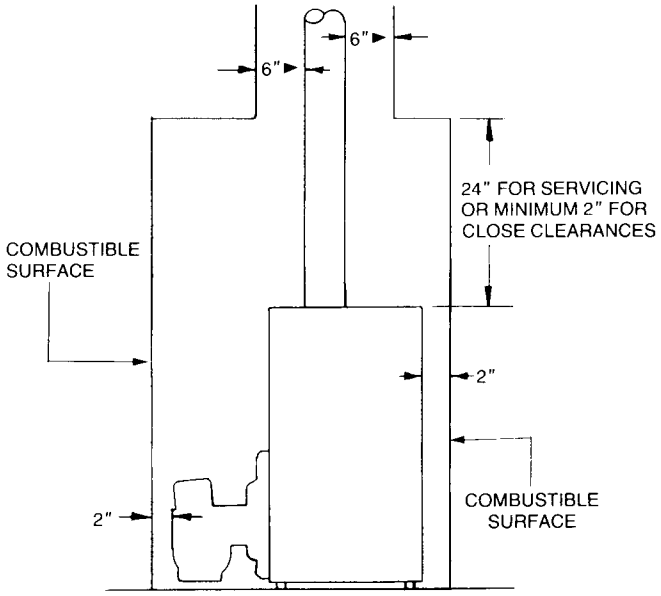
*** Factory fabricated board made of noncombustible materials, normally fibers, having thermal conductivity in range of 1 BTU inch per sq. ft. per °F or less.

■ Spacers shall be made of noncombustible material.



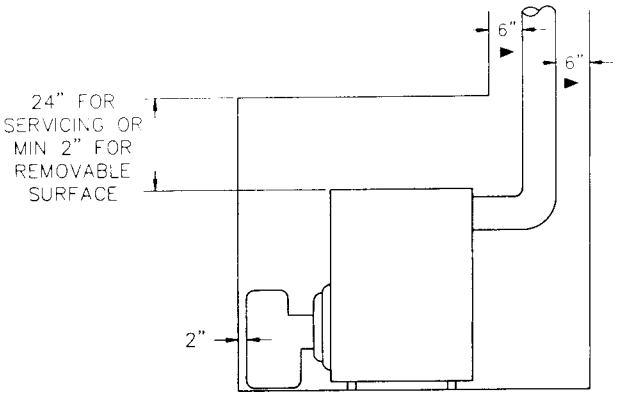
NOTE: Dimension "A" = Desired Clearance As Shown in Table III.

FIGURE 7



►SEE TABLE III AND FIGURE 7

FIGURE 8



NOTE: 2" MIN. ON SIDES

►SEE TABLE III AND FIGURE 7

FIGURE 9

CAUTION Failure to properly pipe boiler may result in improper operation and damage to boiler or building.

WATER BOILER

Boiler has built-in air elimination system. A separate air eliminating device is not needed if expansion tank is piped as shown.

Refer to table IV and Figures 10 and 11.

1. Size expansion tank to system design requirements.

   Undersized expansion tanks cause system water to be lost from relief valve and make-up water added through fill valve. Eventual section failure can result. Expansion tank installation:

   a) Closed type expansion tank—connect from the 3/4" N.P.T. tapping "N" to the expansion tank using 3/4" N.P.T. piping. Horizontal expansion tank piping must pitch upward toward tank at least 1 inch for each 5 feet of piping.

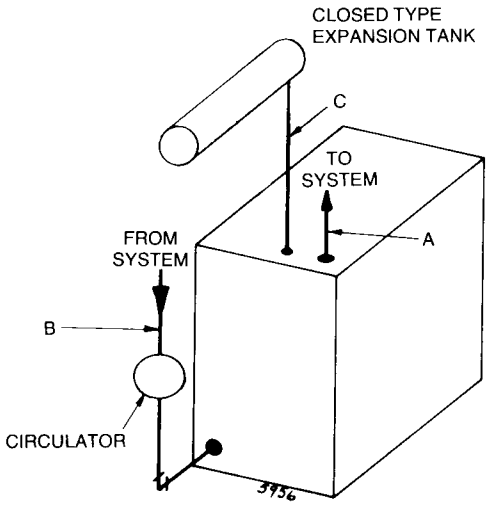


FIGURE 10
PIPING CONNECTIONS FOR WATER BOILERS WITH CLOSED-TYPE EXPANSION TANK

   b) Closed diaphragm pre-pressurized type expansion tank—may be located anywhere in the system, preferably near the boiler.

NOTICE A manual or automatic type air vent must be installed in the 3/4" N.P.T. tapping "N" when a closed diaphragm pre-pressurized tank is used. Refer to Figure 11.

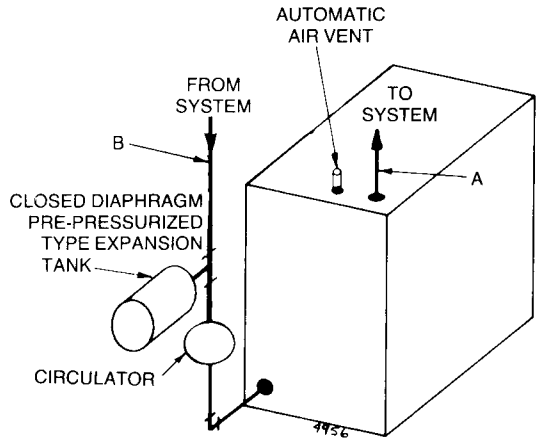


FIGURE 11
PIPING CONNECTIONS FOR WATER BOILERS WITH CLOSED DIAPHRAGM PRE-PRESSURIZED TANK

TABLE IV *WATER BOILER PIPE SIZES

Boiler Size	Supply Pipe Size "A"	Return Pipe Size "B"	Piping to Expansion Tank "C"
268/268V	1" N.P.T.	1" N.P.T.	3/4" N.P.T.
368–468/368V–468V	1 1/4" N.P.T.	1 1/4" N.P.T.	3/4" N.P.T.
568–768/568V–768V	1 1/2" N.P.T.	1 1/2" N.P.T.	3/4" N.P.T.
868–968	2" N.P.T.	1 1/2" N.P.T.	3/4" N.P.T.

*Minimum pipe size with 20°F temperature rise through the boiler.

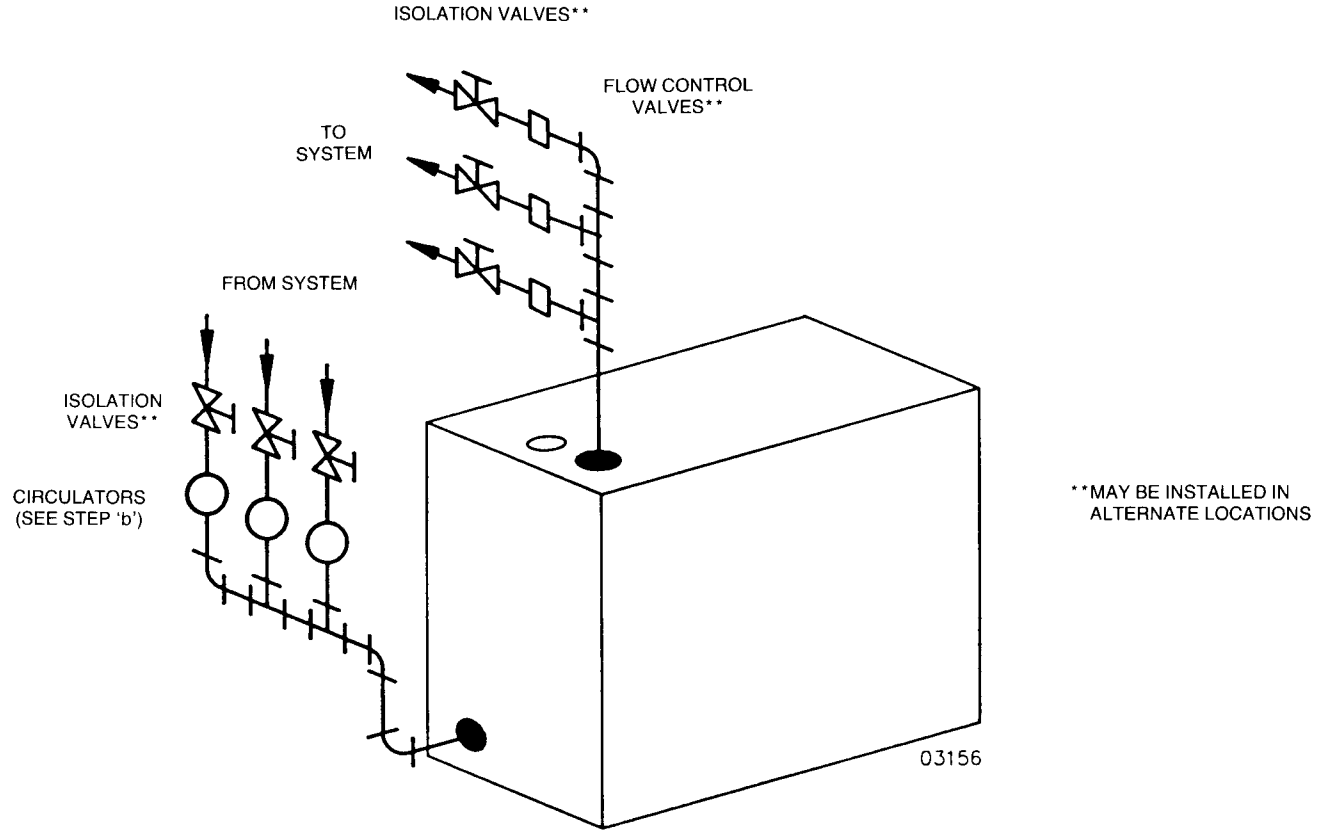
2. Connect supply, return and cold water fill piping.
3. Install water relief valve in K1 tapping.

WARNING Relief valve discharge piping must be piped near to the floor or to a floor drain to eliminate potential of severe burns. Do not pipe where freezing could occur.

4. **Low water cut-off:**
   i) Should be installed if boiler is located above radiation level.
   ii) May be required on water boilers by certain state, local or territorial codes or by insurance companies.

   Use a low water cut-off designed for water installations. An electrode probe type is recommended. Install in a tee in supply piping above boilers.
5. **If the system is to comply with ASME codes**, an additional high temperature limit is needed. Purchase and install in supply piping from the boiler.

6. **For multiple zoning with circulators**, these changes must be made (see Figure 12):
   a) Size each circulator to individual circuit requirements.
   b) Remove circulator and preformed pipe (when furnished as standard equipment).
   c) From 1½" N.P.T. tapped return inlet at front of boiler, construct a pipe manifold according to the number of circulators used.
   d) Install circulators.
   e) Install flow control values to prevent gravity circulation.
   f) Install balancing valves to adjust the flow so it is about the same in each zone.
   g) Separate relays (Honeywell R845A, White-Rodgers 829A-845, or equivalent) are required for each additional circulator.
7. **For multiple zoning with zone valves,** install balancing valves to adjust the flow so it is about the same in each zone. A separate transformer is recommended to power zone valves. Refer to zone valve manufacturer's instructions.



MULTIPLE ZONING WITH CIRCULATORS
FIGURE 12

USE WITH REFRIGERATION SYSTEM

The boiler must be installed so that chilled medium is piped in parallel with the heating boiler with appropriate valves to prevent the chilled medium from entering the boiler. Consult I=B=R Installation and Piping Guides.

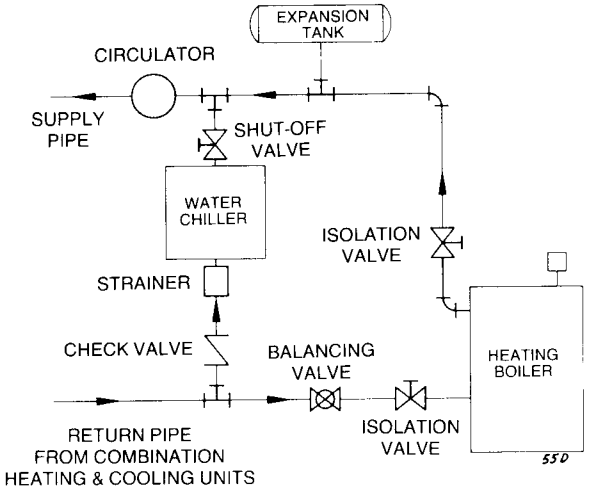


FIGURE 13
PIPING FOR COMBINATION HEATING & COOLING (REFRIGERATION) SYSTEMS

BYPASS PIPING

BYPASS PIPING IS NOT NORMALLY REQUIRED ON TYPICAL BASEBOARD SYSTEM.

Bypass piping should be used for the following installations. Bypass, supply, and return piping should be same size.

1. To protect system radiant panels, plaster, etc. from high temperature water supplied from boiler, see Figure 14.

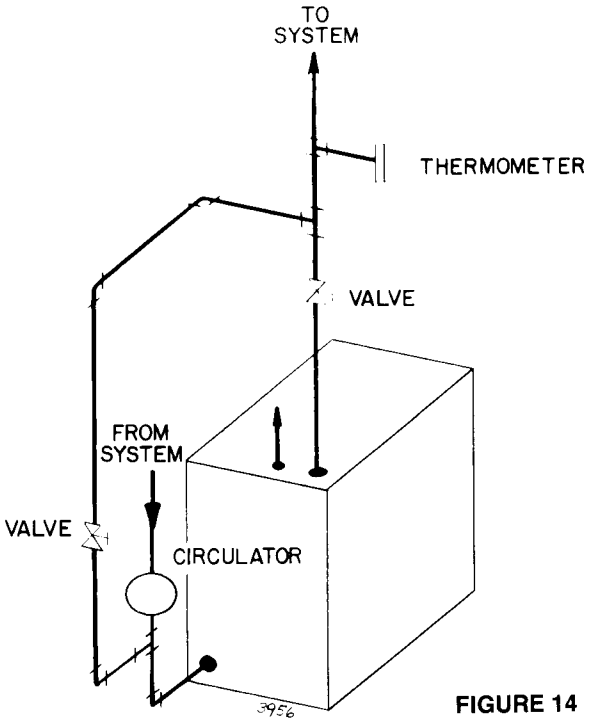


FIGURE 14

2. To protect boiler from condensation formed by low water temperature returned from large water content converted gravity systems, etc., see Figure 15.

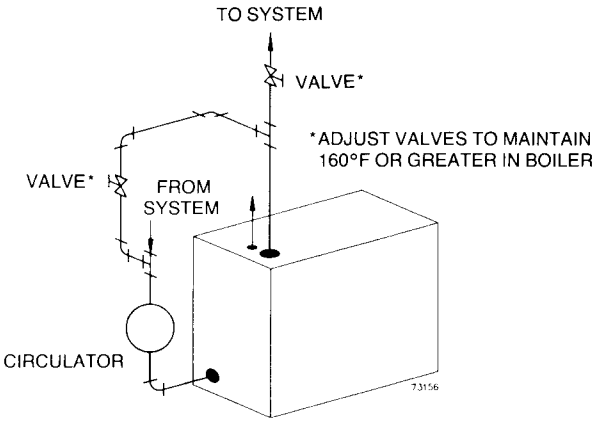


FIGURE 15

3. To protect boiler from condensation while protecting system from high water temperatures, as in large water content radiant ceiling panels, see Figure 16.

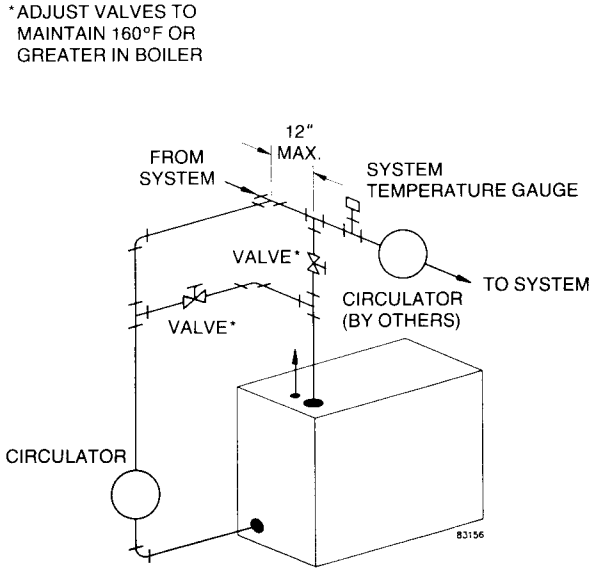


FIGURE 16

STEAM BOILER

1. Connect piping near boiler as shown in Table V and Figures 17 or 18.
2. Connect cold water fill supply piping close to boiler in the condensate return piping.
3. Install steam relief valve in "N" tapping.

WARNING Relief valve discharge piping must be piped near to floor or to a floor drain to eliminate potential of severe burns. Do not pipe where freezing could occur.

TABLE V STEAM BOILER PIPE SIZES

Steam Boiler Size	Riser Pipe Size		Header*	Equalizer
	A	B	H	J
368–768	2"	—	2"	1¼"
868–968	2"	2"	2½"	1¼"

*24" minimum from water line to the bottom of header.

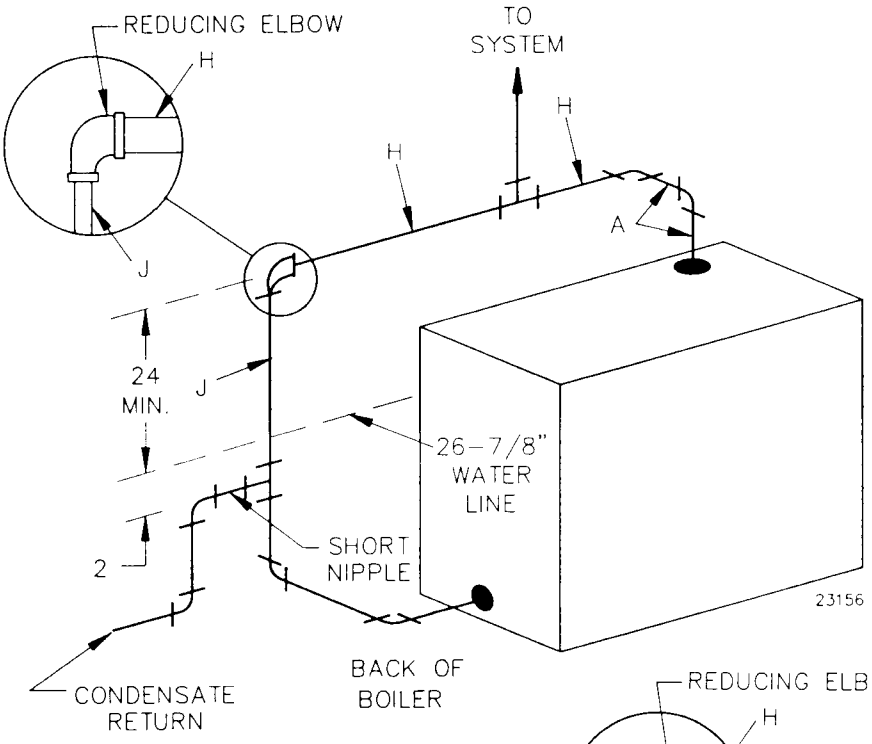


FIGURE 17
PIPING CONNECTIONS
FOR SIZE 3–7 STEAM BOILERS

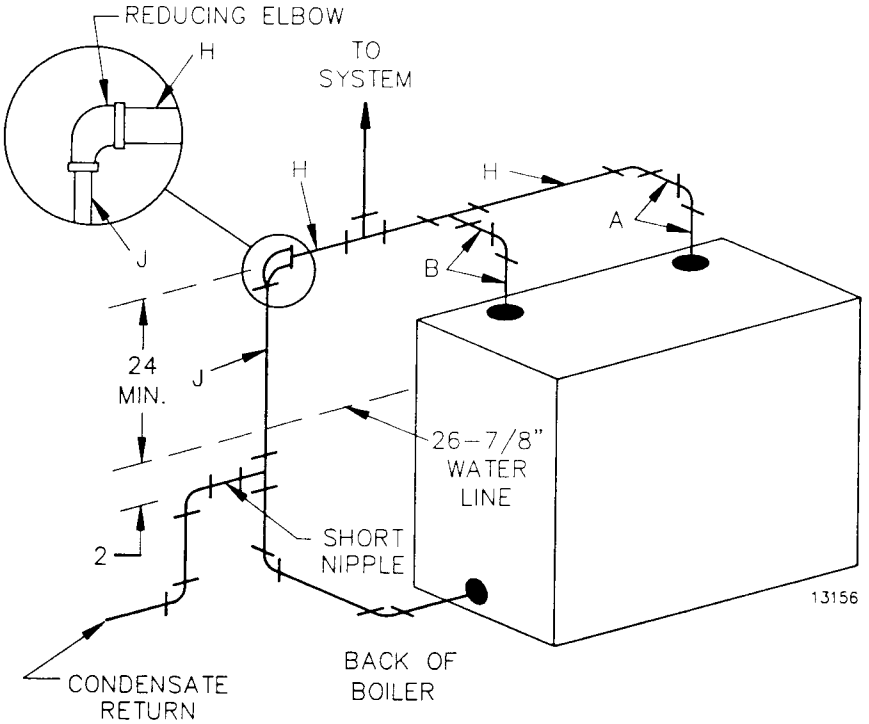


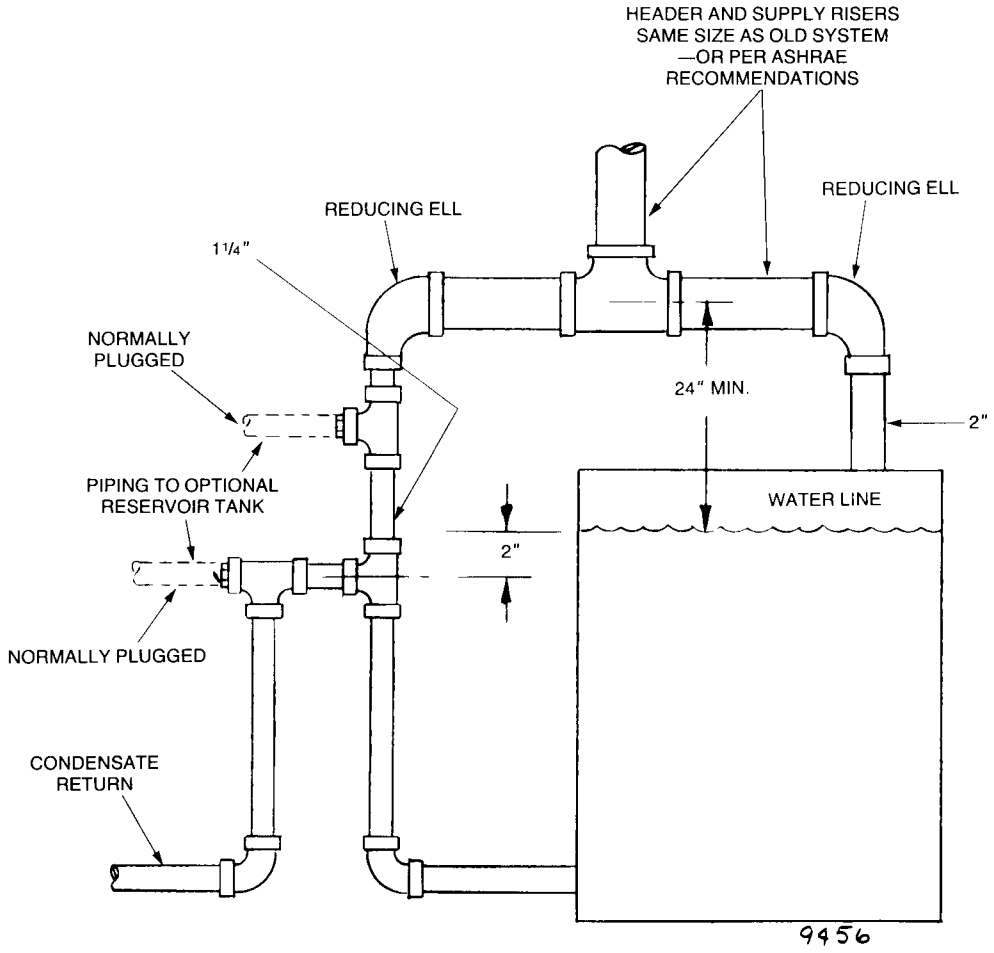
FIGURE 18
PIPING CONNECTIONS
FOR SIZE 8–9 STEAM BOILERS

REPLACEMENT BOILER CONNECTIONS
ONE-PIPE STEAM SYSTEM

Recommended piping for replacement boiler on older one-pipe steam system is shown below.

Some installations may require an added water tank for additional steaming capacity. By installing two plugged tees as shown in Figure 19, a tank can easily be added if necessary.

Obtain Bulletin AE-8403 from your Weil-McLain distributor for tank sizing.



NOTE:
SWING JOINTS NOT SHOWN

FIGURE 19
RECOMMENDED PIPING FOR REPLACEMENT STEAM BOILER—ONE-PIPE SYSTEM

TANKLESS HEATER HOOK-UP

Install as shown in Figure 20 (water boiler) or Figure 21 (steam boiler). 268/268V cannot use a tankless heater.

1. Install automatic mixing valve.
2. Install flow regulating valve. Size according to intermittent draw of heater as shown in Table VI.
3. Operating control with a small differential scale is recommended. Install in temperature control tapping in heater plate.
4. In hard water areas, it is advisable to soften cold domestic supply water to tankless heater to prevent lime build-up.

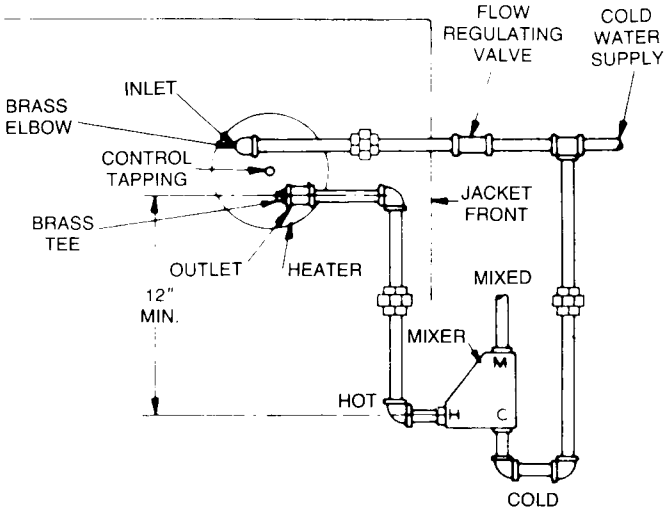


FIGURE 20
TANKLESS HEATER PIPING (WATER BOILER)

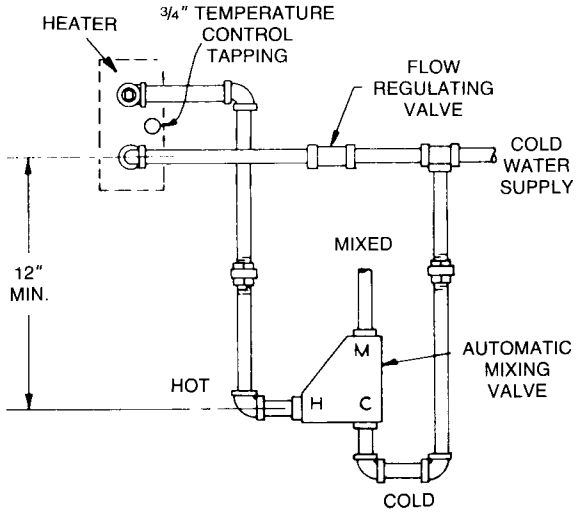


FIGURE 21
TANKLESS HEATER PIPING (STEAM BOILER)

TABLE VI STEAM AND FORCED HOT WATER BOILER TANKLESS HEATER RATINGS

Boiler■ Size	Heater No.	*Intermittent Draw GPM 100°F. Average Temp. Rise	**Continuous Draw GPM 100°F Temp. Rise	Inlet and Outlet Tappings	Temp. Control Tapping
WATER					
368/368V	E-624	3.00	2.00	1/2"	3/4"
468/468V	E-624	3.25	2.70	1/2"	3/4"
568/568V	E-624	3.25	3.30	1/2"	3/4"
668/668V	E-626	3.50	4.00	1/2"	3/4"
768/768V	E-632	4.25	4.60	1/2"	3/4"
868–968	E-632	4.50	4.75	1/2"	3/4"
STEAM					
368	35-S-29	3.00	2.00	3/4"	3/4"
468	35-S-29	3.25	2.70	3/4"	3/4"
568	35-S-29	3.50	3.30	3/4"	3/4"
668	35-S-29	3.75	4.00	3/4"	3/4"
768–968	35-S-29	4.00	4.60	3/4"	3/4"

Weil-McLain ratings based on 60 PSIG domestic water pressure at heater.
* Gallons of water per minute heated from 40° to 140°F. with 200°F. boiler water temperature.
** Continuous draw—no recovery period. ■ Not available on 268/268V boilers.

STORAGE HEATER HOOK-UP (forced hot water boiler only)

NOTICE 62-2-E Storage Heater cannot be used with 268/268V thru 568/568V forced hot water boilers or any size steam boiler.

1. Locate tank as high as possible above boiler.
2. Vertical type storage tank can be used if bottom of tank can be located above top of boiler.
3. To provide gravity circulation:
   a) Horizontal supply from heater to tank must pitch upward 1 inch for each 10 feet of piping.
   b) Horizontal return from tank to heater must pitch downward 1 inch for each 10 feet of piping.
4. Locate return piping above storage heater.
5. Use as few elbows and pipe fittings as possible

TABLE VII STORAGE HEATER RATINGS

Boiler Size*	Storage Heater Number	180° Boiler Water Heater Capacity Gallons 40°–140° Rise	212° Boiler Water Heater Capacity Gallons 40°–140° Rise
668–968 668V–768V	62-2-E	50 in 3 Hours	70 in 3 Hours
Recommended Storage Tank		50–90 Gallons	75–125 Gallons

*No. 62-2-E storage heater cannot be used with 268/268V through 568/568V water boilers or with any steam boilers.

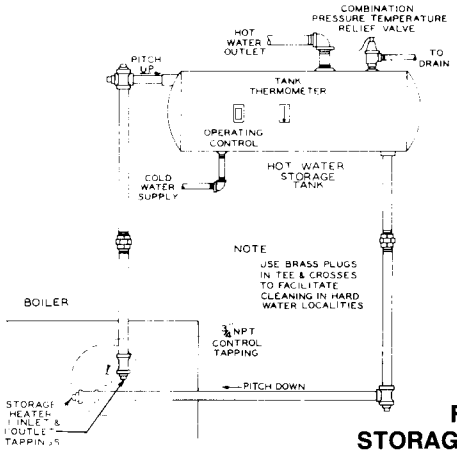


FIGURE 22
STORAGE HEATER PIPING

Section VI: Non-packaged Boilers—Control & Burner Installation

WARNING Failure to properly install, pipe and wire boiler controls may result in severe damage to boiler, building and personnel.

WATER BOILER CONTROLS

1. Install control where shown on tapping table, page 5.

STEAM BOILER CONTROLS

1. Connect a low water cut-off to gauge glass tappings K1 and K2. Refer to Figure 23. Follow instructions packed with control. Pipe drain near the floor or floor drain.
2. Install the pigtail syphon, pressure gauge and steam pressure limit control. See Figure 23.

OIL BURNER

For B-68/68V boiler:

1. Place gasket over end of air tube.
2. Loosely screw three mounting bolts into boiler mounting plate.
3. Mount burner.
4. Tighten mounting bolts.

For A-68/68V boiler:

1. Secure universal mounting flange and gasket to burner mounting plate. Use three bolts provided.
2. Position burner so it is level to 1½° tilt downward. Air tube should be flush to ¼ inch recessed from inside wall of combustion chamber.

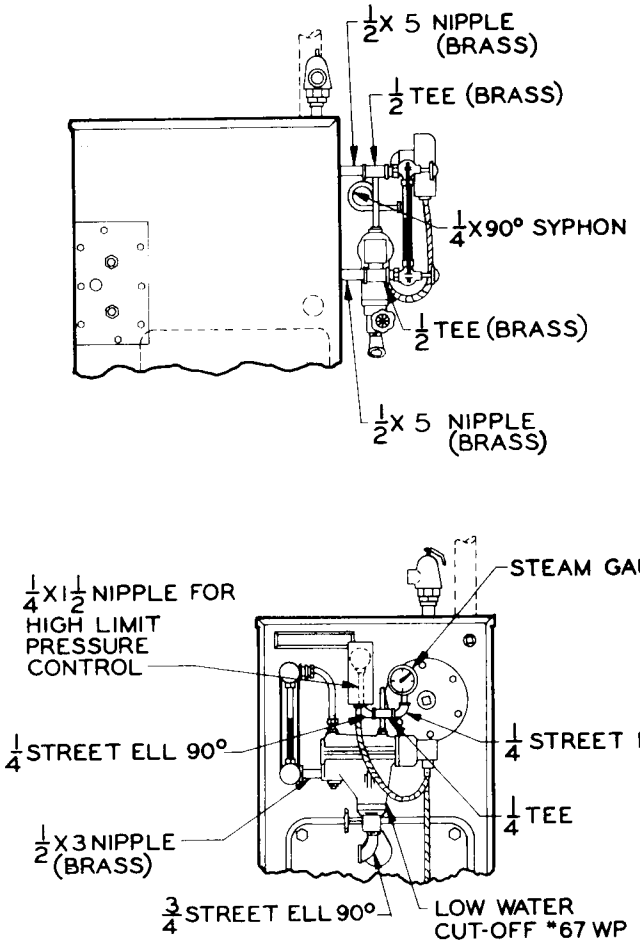


FIGURE 23
STEAM CONTROLS

Section VII: Wiring & Fuel Line Piping

WIRING

WARNING For your safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electrical shock hazard.

Wiring must comply with the National Electrical Code and any additional national, state, or local codes.

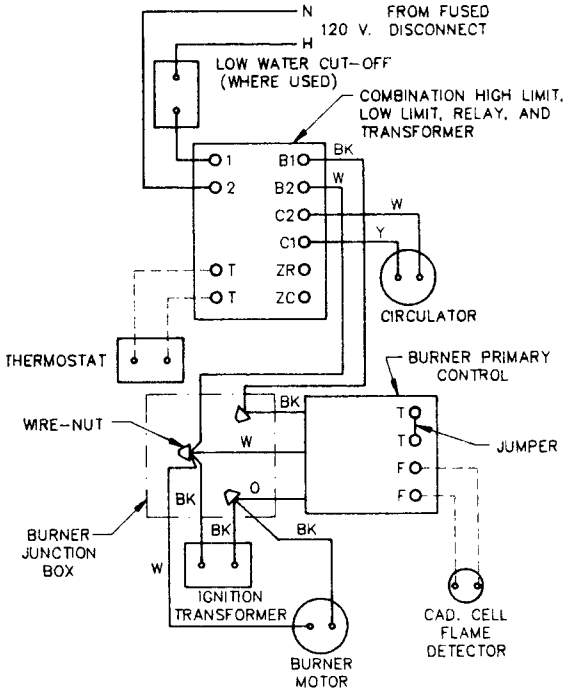
See wiring diagram, page 15 for proper wiring.

All safety circuit wiring must be N.E.C. Class 1.

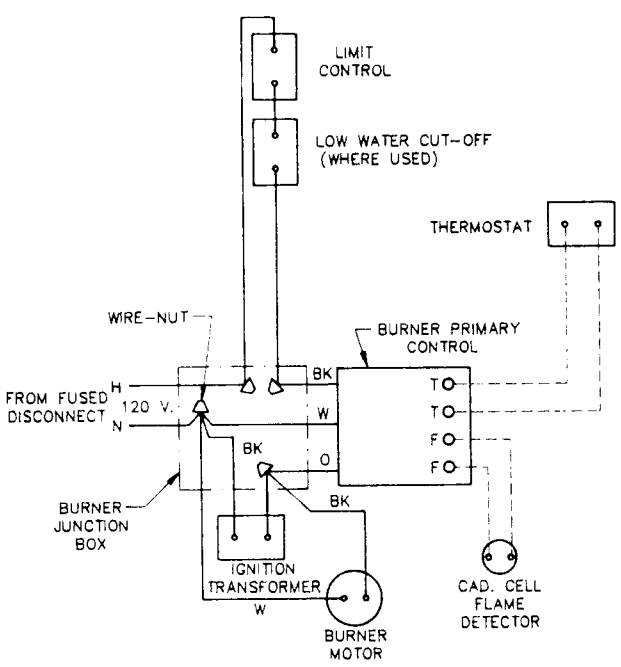
For any additional electrical safety controls, use No. 14 gauge wire. Electrical supply wiring to burner should be No. 14 gauge or heavier with fused disconnect switch. Be sure boiler is properly grounded at switch box.

FUEL LINE PIPING

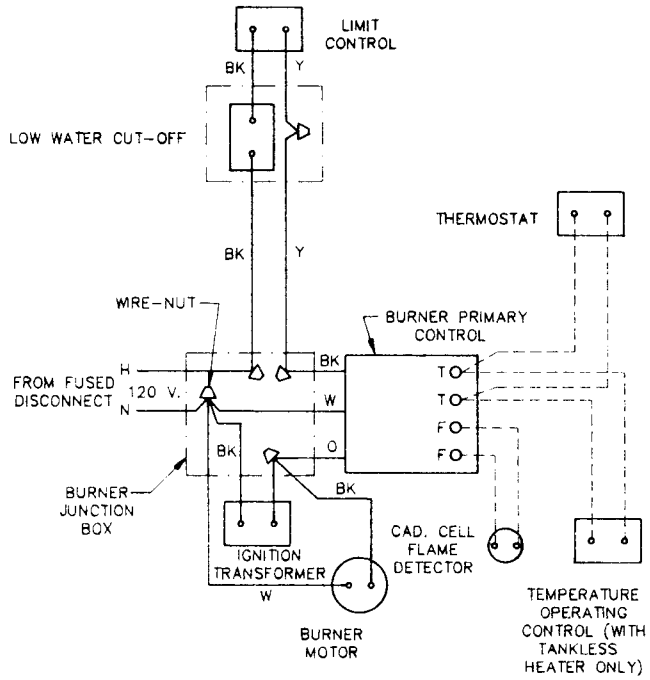
Refer to separate burner manual and any local or national code requirements which may apply to sizing and installing the fuel line piping.



FORCED HOT WATER BOILER
WITH OR WITHOUT HEATER



GRAVITY HOT WATER BOILER
WITHOUT HEATER



STEAM BOILER
WITH OR WITHOUT HEATER

LOW VOLTAGE — — — —
HIGH VOLTAGE ————

WARNING

Electrical shock hazard. Can cause severe injury or death. Disconnect power before installing and/or servicing.

NOTES:
1. All wiring must comply with the National Electrical Code and any additional National, State, or Local code requirements having jurisdiction.
2. All safety circuit wiring must be N.E.C. Class 1.
3. Refer to control components instruction sheets packed with the boiler for application information.
4. Use 90°C. thermoplastic wire, or equivalent, if any of the original wire must be replaced.

OIL-FIRED BOILER WIRING DIAGRAM

WEIL-McLAIN
Michigan City, Indiana 46360
A Marley Company

MC 3454-0387-WM

WATER TREATMENT

Never use petroleum based stop-leak compounds. Water seal deterioration will occur, resulting in leakage between sections.

Continual make-up water will reduce boiler life. Minerals can build up in the sections, reducing heat transfer, overheating the cast iron, and causing section failure.

For unusually hard water areas or low pH conditions (less than 7.0) consult local water treatment company.

Freeze protection (when used):

Use antifreeze especially made for hydronic systems. Inhibited propylene glycol is recommended. DO NOT use undiluted or automotive type antifreeze.
50% solution provides maximum protection to about $-30°F$.
Local codes may require a back-flow preventer or actual disconnect from city water supply.
Determine quantity according to system water content. Boiler water content is listed on page 18.
Follow antifreeze manufacturer's instructions.

FILLING WATER BOILER

1. Close manual air vents, drain cocks, and automatic air vent, if used.
2. Fill to correct system pressure. Correct pressure will vary with each application.
3. Open automatic air vent two turns, if used.
4. a) Starting on lowest floor, open air vents one at a time until water squirts out. Close vent.
   b) Repeat with remaining vents.
5. Refill to correct pressure.
6. Close, then open automatic air vent, if used, one full turn for normal boiler operation.

FILLING STEAM BOILER

1. Do not fill (except for leakage tests) until boiler is ready to be fired.
2. Fill to normal waterline, halfway up gauge glass.
3. Boiler water pH 7.0 to 8.5 is recommended.
4. Follow skimming procedure.

BURNER ADJUSTMENT

CAUTION Final burner adjustments must be made using combustion test equipment to assure proper operation. DO NOT FIRE BOILER WITHOUT WATER OR SECTIONS WILL OVERHEAT.

1. Refer to burner manual for start-up. Adjust air band to provide a clean yellow flame without smokey tips.
2. Allow boilers to heat to design conditions.
3. Using combustion test equipment, adjust burner for:
   a) 0 smoke with maximum CO_2.
   b) -0.02 inches W.C. negative draft overfire.

SKIMMING STEAM BOILER

CAUTION Clean newly installed steam boiler to remove oil and grease. Failure to properly clean can result in violent fluctuations of water level, water passing into steam mains, or high maintenance costs on strainers, traps and vents. Do NOT use petroleum based products in boiler.

1. Provide $1\frac{1}{2}$" piping from boiler skim tapping to floor drain.
2. Adjust waterline to midpoint of skim piping.
3. Fire boiler to maintain a temperature below steaming rate during skimming process.
4. Feed in water to maintain water level. Cycle burner to maintain temperature below steaming.
5. Continue skimming until discharge is clear. This may take several hours.
6. Drain boiler. While boiler is warm but NOT HOT, flush all interior surfaces under full pressure until drain water runs clear.
7. Remove skim piping and plug tapping.
8. Close drain cock. Fill with fresh water to waterline. Start burner and steam for 15 minutes to remove dissolved gases. Stop burner.
9. Check traps and air vents for proper operation.

Section IX: Check-out Procedure

CHECK-OUT PROCEDURE
(Check-off steps as completed.)

- ☐ 1. Water boiler:
  - a. System properly filled with water?
  - b. Air purged from system?
  - c. Automatic air vent, if used, open one turn?
- ☐ 2. Steam boiler:
  - a. Boiler properly filled with water?
  - b. System vents operating properly?
  - c. Boiler properly skimmed?
- ☐ 3. Air purged from oil piping? Piping checked for leaks?
- ☐ 4. Proper draft and burner flame? Final adjustment made with combustion test equipment?
- ☐ 5. Test safety controls: If boiler is equipped with a low water cut-off or additional safety controls, test for operation as outlined by manufacturer. Burner should be operating and should go off when controls are tested. When safety devices are restored, burner should reignite.
- ☐ 6. Test limit control: While burner is operating, move indicator of limit control below actual boiler water temperature or pressure. Burner should go off. Circulator should continue to operate (water boilers only). Raise limit control above boiler water temperature or pressure and burner should reignite.
- ☐ 7. Limit control set to design temperature or pressure requirements of system? Maximum limit setting –240°F. (water boilers)–15 psi (steam boilers).
- ☐ 8. For multiple zones, flow adjusted so it is about the same in each zone (water boilers only)?
- ☐ 9. Thermostat heat anticipator set properly? Refer to wiring diagram.
- ☐ 10. Boiler cycled with thermostat? Raise to highest setting. Boiler should go through normal start-up cycle. Lower to lowest setting. Boiler should go off.
- ☐ 11. Several operating cycles observed for proper operation?
- ☐ 12. Room thermostat set to desired temperature?
- ☐ 13. All instructions shipped with boiler reviewed with owner or maintenance person, returned to envelope and given to owner or displayed near boiler?
- ☐ 14. On initial start-up, check for leaks in system piping. If found, repair at once.

Installation and Service Certificate

BOILER MODEL _____ SERIES _____ CP NUMBER _____ DATE INSTALLED _____

BTU INPUT _____

- ☐ Installation instructions have been followed.
- ☐ Check-out sequence has been performed.
- ☐ Above information is certified to be correct.
- ☐ Information received and left with owner/maintenance person.

Installer _____ _____ _____
(Company) (Address) (Phone) (Installer's Signature)

RATINGS

BOILER PREFIX	BOILER NUMBER	I=B=R BURNER CAPACITY GPH	†DOE HEATING CAPACITY MBH STEAM	†DOE HEATING CAPACITY MBH WATER	NET I=B=R RATINGS** STEAM SQ. FT.	NET I=B=R RATINGS** STEAM MBH	NET I=B=R RATINGS** WATER MBH	I=B=R CHIMNEY SIZE INCHES	I=B=R CHIMNEY HEIGHT FEET	BOILER WATER CONTENT (GAL.) WATER P68; P,A,orB-68V	BOILER WATER CONTENT (GAL.) WATER A or B-68	BOILER WATER CONTENT (GAL.) STEAM (To Waterline)
P	268/268V	0.70	—	86	—	—	74.8	8 × 8	15	7.0	—	—
A,B, P	368 368V	0.95 0.95	113 —	114 114	355 —	84.8 —	99.1 99.1	8 × 8 8 × 8	15 15	13.3 13.3	13.3 13.3	11.2 —
A,B, P	468 468V	1.25 1.25	149 —	151 151	465 —	111.8 —	131.3 131.3	8 × 8 8 × 8	15 15	8.6 8.6	14.9 14.9	12.4 —
A,B, P	568 568V	1.50 1.50	179 —	181 181	560 —	134.3 —	157.4 157.4	8 × 8 8 × 8	15 15	10.2 10.2	16.5 16.5	13.6 —
A,B, P	668 668V	1.80 1.80	216 —	218 218	675 —	162.0 —	189.6 189.6	8 × 8 8 × 8	15 15	11.8 11.8	18.1 18.1	14.8 —
A,B, P	768 768V	2.05 2.05	246 —	248 248	770 —	184.5 —	215.7 215.7	8 × 8 8 × 8	15 15	13.4 13.4	19.7 19.7	16.1 —
A,B	868	2.30	269■	269■	840	201.8	233.9	12 × 12	20	—	21.3	17.4
A,B	968	2.55	298■	298■	930	223.6	259.1	12 × 12	20	—	22.9	18.6

† Based on standard test procedures prescribed by the United States Department of Energy at combustion condition of 13% CO_2.

** Net I-B-R ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pick-up. Water ratings are based on a piping and pick-up allowance of 1.15. Steam ratings are based on an allowance of 1.333. An additional allowance should be made for unusual piping and pick-up loads.

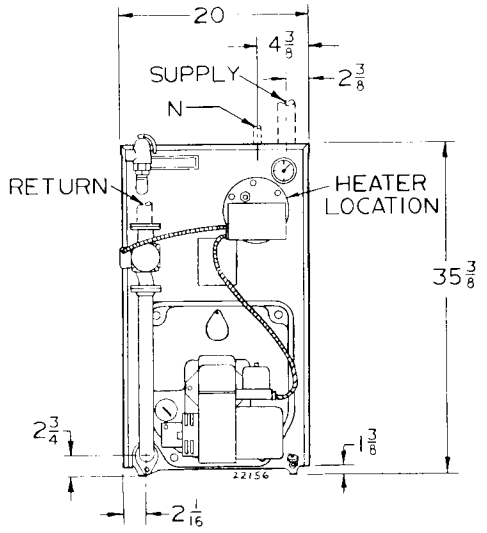
■ IBR Gross Output

DIMENSIONS (Inches)

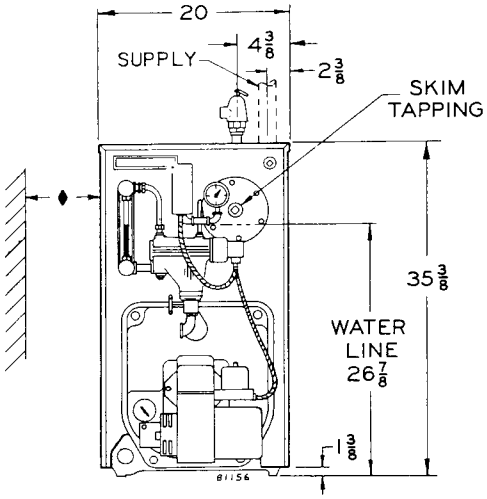
68 REAR FLUE OUTLET

BOILER SIZE	A (IN)	B (IN)	L* (IN) PACKAGED WATER	L* (IN) PACKAGED STEAM OR KNOCKED DOWN WATER OR STEAM
268	—	9 1/2	10 3/8	—
368	—	9 1/2	13 3/8	13 3/8
468	—	12 1/2	13 3/8	16 3/8
568	—	15 1/2	16 3/8	19 3/8
668	—	18 1/2	19 3/8	22 3/8
768	—	21 1/2	22 3/8	25 3/8
868	25 1/4	24 1/2	—	28 3/8
968	28 1/4	27 1/2	—	31 3/8

*Jacket extension increases length 17 1/2 in.

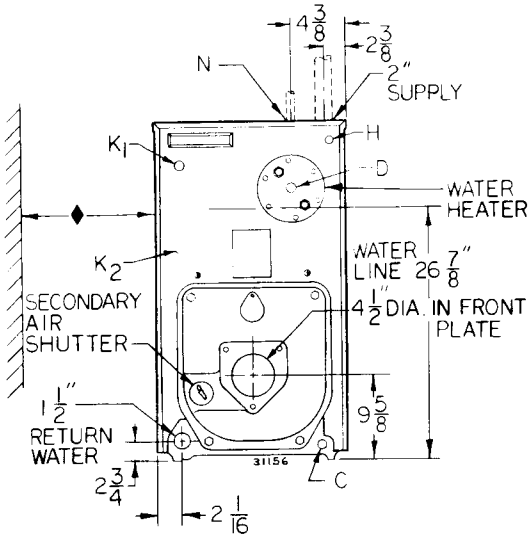


PACKAGED FRONT (WATER)



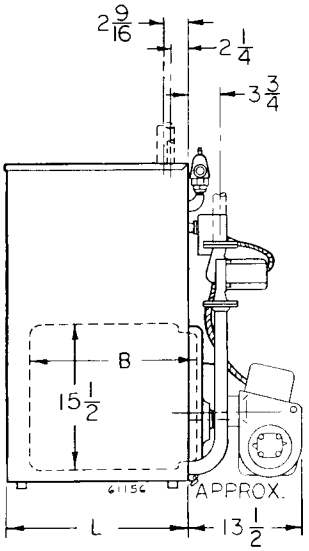
PACKAGED FRONT (STEAM)

♦15" minimum heater clearance.

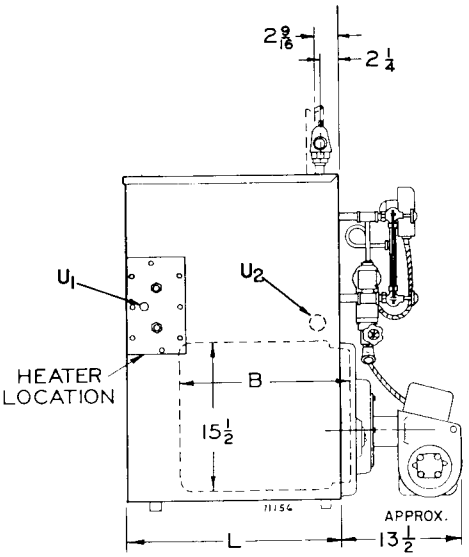


ASSEMBLED FRONT

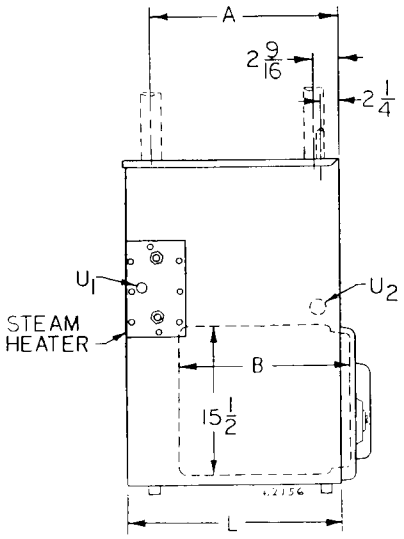
68 REAR FLUE OUTLET (Continued)



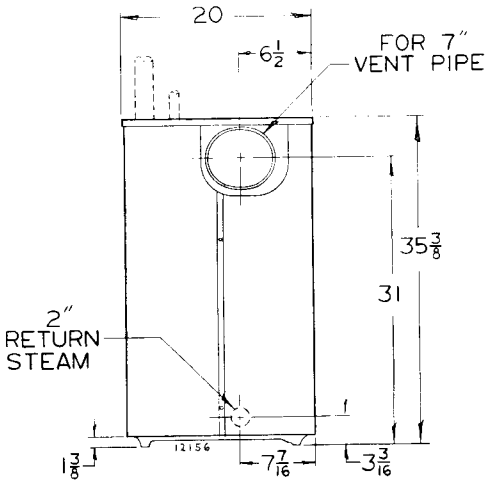
PACKAGED SIDE (WATER)



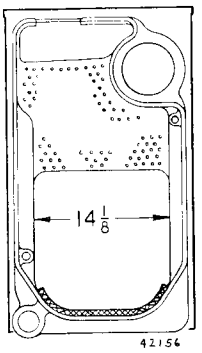
PACKAGED SIDE (STEAM)



ASSEMBLED LEFT SIDE



BACK



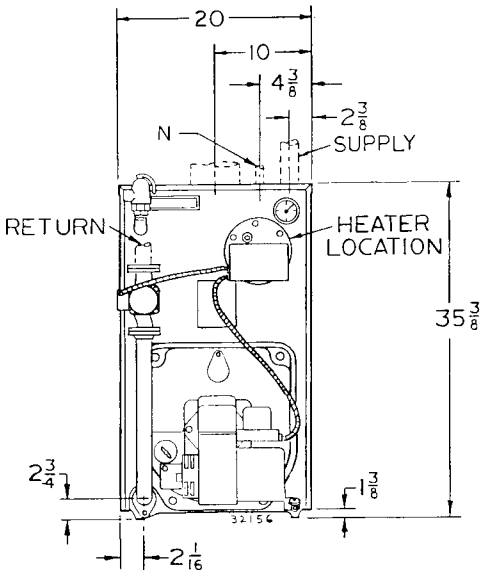
INTERMEDIATE

68V TOP FLUE OUTLET

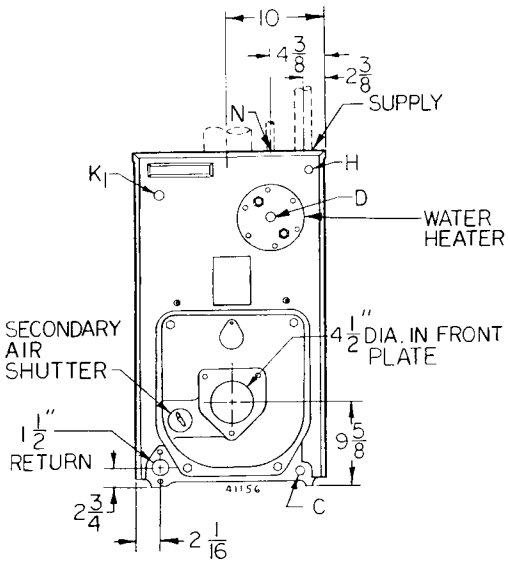
DIMENSIONS

BOILER SIZE	INCHES			
	A	B	E	L*
268V +	5	9 1/2	5 9/16	10 3/8
368V	5	9 1/2	5 9/16	13 3/8
468V	6	12 1/2	7 1/16	13 3/8
568V	6	15 1/2	7 1/16	16 3/8
668V	7	18 1/2	7 1/16	19 3/8
768V	7	21 1/2	7 1/16	22 3/8

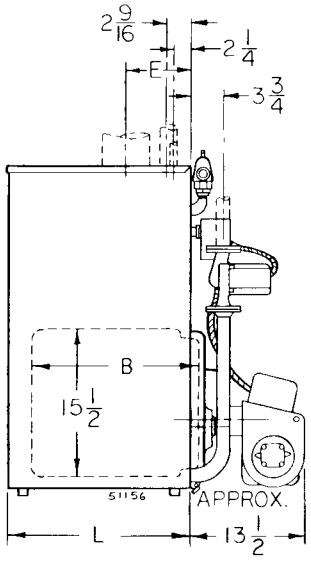
+ 268V available as packaged unit only
*Jacket extension increases length 17 1/2 in.



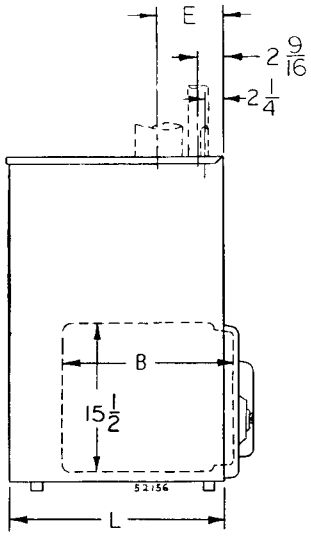
PACKAGED FRONT (WATER ONLY)



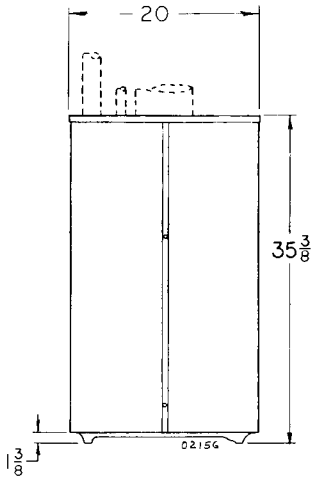
ASSEMBLED FRONT



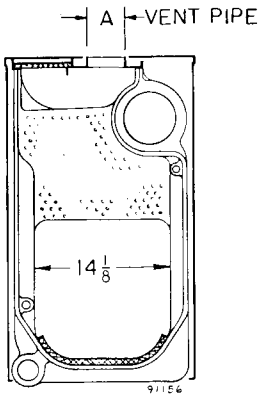
PACKAGED SIDE (WATER ONLY)



ASSEMBLED LEFT SIDE

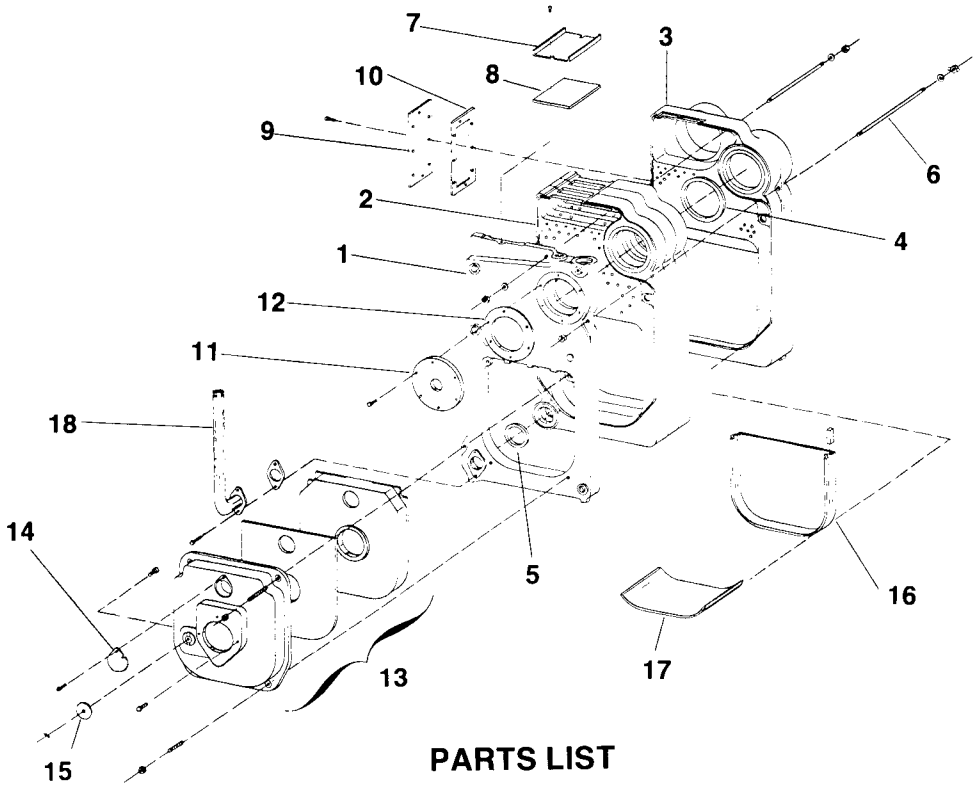


BACK



INTERMEDIATE

68 BOILER



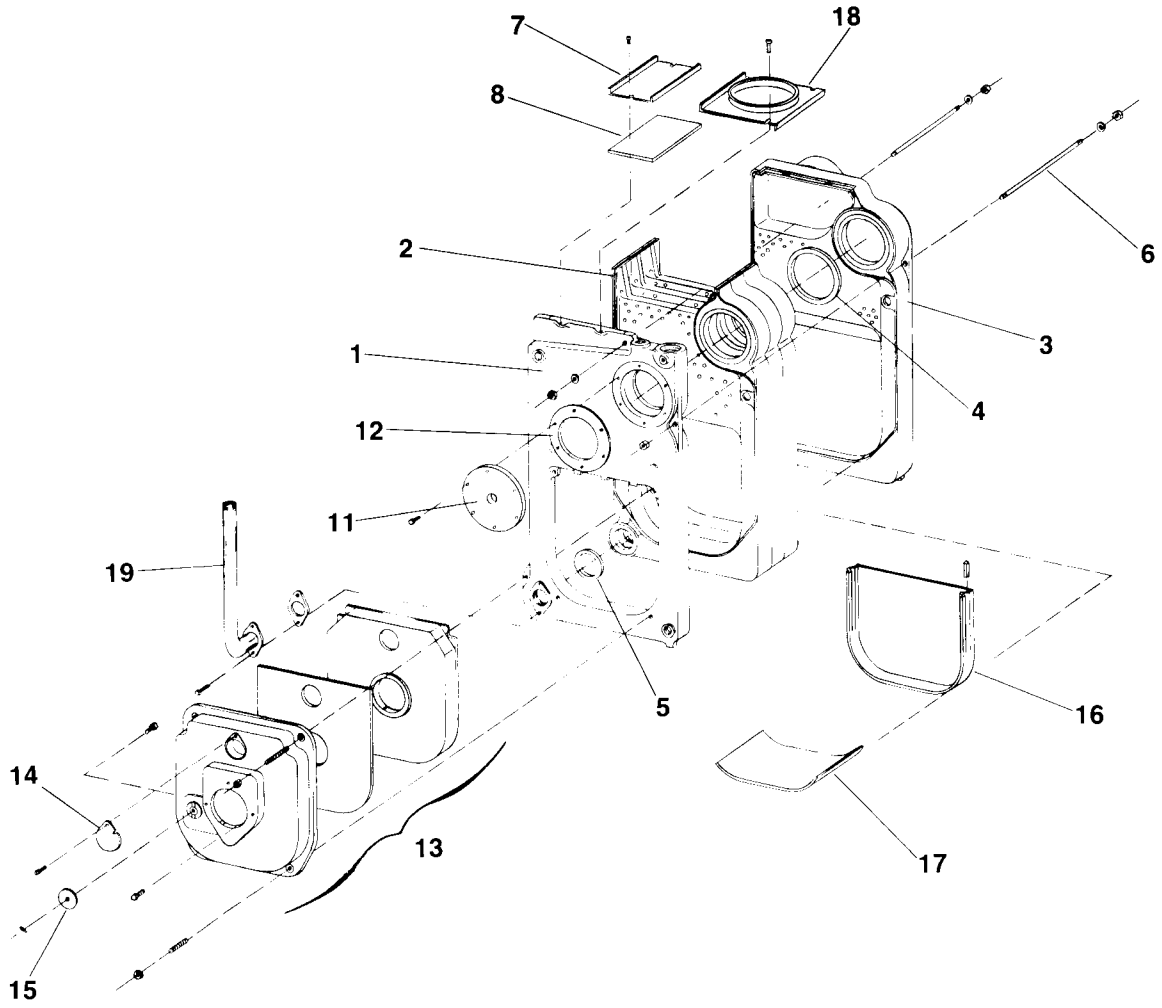
PARTS LIST

REF. NO.	DESCRIPTION	PART NUMBER
1	Front Section, P-68-W (6813) Front Section, P-68-S, A or B-68-W or S (6813)	316-601-216 316-601-249
2	Intermediate Section (6815) Intermediate Section w/Lugs, A or B-868/968-W or S (6816)	316-601-222 316-601-225
3	"T" Back Section, Wide, P-68-S, A or B-68-W or S (6818) (except 868/968) "T" Back Section, Wide w/Supply, A or B-868/968-W or S (6819) Back Section, Narrow, P-268-W/P-468-W thru P-768-W (6814) Back Section, Wide, P-368-W (6817)	316-601-231 316-601-234 316-601-219 316-601-228
4 5	Elastomer Seal, 6" (top) Elastomer Seal, 3" (bottom)	592-800-007 592-800-010
6	Tie Rod—1/2 x 8 1/2 (P-268-W) 1/2 x 10 (P-368-W) 1/2 x 11 1/2 (P-468-W) 1/2 x 14 1/2 (P-568-W) 1/2 x 17 1/2 (P-668-W) 1/2 x 20 1/2 (P-768-W) 1/2 x 10 (P-368-S, A or B-368-W or S) 1/2 x 13 (P-468-S, A or B-468-W or S) 1/2 x 16 1/4 (P-568-S, A or B-568-W or S) 1/2 x 19 1/2 (P-668-S, A or B-668-W or S) 1/2 x 22 1/4 (P-768-S, A or B-768-W or S) 1/2 x 11 1/2 (A or B-868-W or S) 1/2 x 13 (A or B-868/968-W or S) 1/2 x 14 1/2 (A or B-968-W or S) 1/2 x 51/2 (A or B-868/968-W or S) Reg. Hex Nut, 1/2-13 Lockwasher, 1/2 Helical Spring Tie Rod—3/8 x 7 1/2 (P-268-W) 3/8 x 9 (P-368-W) 3/8 x 10 1/2 (P-468-W) 3/8 x 13 1/2 (P-568-W) 3/8 x 16 1/4 (P-668-W) 3/8 x 19 1/2 (P-768-W) 3/8 x 9 (P-368-S, A or B-368-W or S) 3/8 x 12 (P-468-S) 3/8 x 12 1/2 (A or B-468-W or S) 3/8 x 15 (P-568-S, A or B-568-W or S) 3/8 x 18 (P-668-S, A or B-668-W or S) 3/8 x 21 (P-768-S, A or B-768-W or S) 3/8 x 10 1/2 (A or B-868 W or S) 3/8 x 13 1/2 (A or B-968 W or S) 3/8 x 12 1/2 (A or B-868/968 W or S)	560-234-466■ 560-234-467■ 560-234-469■ 560-234-471■ 560-234-474■ 560-234-478■ 560-234-467■ 560-234-468■ 560-234-473■ 560-234-476■ 560-234-479■ 560-234-469■ 560-234-468■ 560-234-471■ 560-234-464■ ■ ■ 560-234-403■ 560-234-400■ 560-234-407■ 560-234-417■ 560-234-430■ 560-234-435■ 560-234-400■ 560-234-408■ 560-234-412■ 560-234-422■ 560-234-433■ 560-234-437■ 560-234-407■ 560-234-417■ 560-234-412■

■ Can be purchased at local supply house.
NOTE: Order burner parts directly from burner manufacturer.

REF. NO.	DESCRIPTION	PART NUMBER
	Reg. Hex Nut, 3/8 Washer, Plain Type A 3/8-.438 x 1.00 x .083	■ ■
	Cope Seal (7' per joint)	591-641-862
7	Cleanout Plate—268/368 468 568 668 768 868 968	450-030-949 450-030-950 450-030-951 450-030-952 450-030-953 450-030-954 450-030-955
8	Cleanout Plate Gasket—268/368 468 568 668 768 868 968	591-221-260 591-221-261 591-221-262 591-221-263 591-221-264 591-221-265 591-221-266
9	Rectangular Heater Cover Plate (Steam) Tankless Heater w/Gasket (Steam) 35-S-29	450-030-934 590-921-666
10	Rectangular Heater Cover Plate Gasket (Steam)	590-317-579
11	Round Heater Cover Plate—3/4" Opening (Water) 1 1/2" Opening (Steam) Tankless Heater w/Gasket (Water)—E-624 E-626 E-632 Storage Heater w/Gasket 62-E-2	592-243-217 592-243-216 590-921-670 590-921-675 590-921-658 590-921-665
12	Round Heater Cover Plate Gasket (Water)	590-317-495
13	Universal Burner Mounting Plate Ass'y (includes burner mounting plate, refractory, and insulation) Front Refractory Cerafelt Insulation	343-500-540 591-000-061 591-221-054
14 15	Observation Port Shutter Secondary Air Shutter	460-039-867 460-039-898
16 17	Rear Refractory Back Refractory Pin Refractory Blanket 268/368 468 568 668 768 868 968	591-000-060 591-000-054 591-221-235 591-221-230 591-221-231 591-221-232 591-221-233 591-221-234 591-221-236
18	Return Pipe Manifold	591-124-002

68V BOILER



PARTS LIST

REF. NO.	DESCRIPTION	PART NUMBER
1	Front Section (6823)	316-601-237
2	Intermediate Section (6825)	316-601-243
3	Back Section, Wide, P-368V-W, A or B-368V-W (6827) Back Section, Narrow, P-468V-W thru P768V-W, A or B-468V-W thru A or B-768V-W (6824)	316-601-246 316-601-240
4 5	Elastomer Seal, 6" (top) Elastomer Seal, 3" (bottom)	592-800-007 592-800-010
6	Tie Rod—1/2 x 81/2 (268V) 1/2 x 10 (368V) 1/2 x 111/2 (468V) 1/2 x 141/2 (568V) 1/2 x 171/2 (668V) 1/2 x 201/2 (768V) Reg. Hex Nut, 1/2–13 Lockwasher, 1/2 Helical Spring Tie Rod—3/8 x 71/2 (268V) 3/8 x 9 (368V) 3/8 x 101/2 (468V) 3/8 x 131/2 (568V) 3/8 x 161/4 (668V) 3/8 x 191/2 (768V) Reg. Hex Nut, 3/8 Washer, Plain Type A 3/8–.438 x 1.00 x .083	560-234-466■ 560-234-467■ 560-234-469■ 560-234-471■ 560-234-474■ 560-234-478■ ■ ■ 560-234-403■ 560-234-400■ 560-234-407■ 560-234-417■ 560-234-430■ 560-234-435■ ■ ■
	Cope Seal (7' per joint)	591-641-862
7	Cleanout Plate—268V/368V 468V 568V 668V 768V	450-030-960 450-030-961 450-030-962 450-030-963 450-030-964

REF. NO.	DESCRIPTION	PART NUMBER
8	Cleanout Plate Gasket—268V/368V 468V 568V 668V 768V	591-221-260 591-221-261 591-221-262 591-221-263 591-221-264
11	Round Heater Cover Plate—3/4" Opening (Water) Tankless Heater w/Gasket (Water)—E-624 E-626 E-632	592-243-217 590-921-670 590-921-675 590-921-658
12	Round Heater Cover Plate Gasket (Water)	590-317-495
13	Universal Burner Mounting Plate Ass'y (includes burner mounting plate, refractory, and insulation) Front Refractory Cerafelt Insulation	343-500-540 591-000-061 591-221-054
14 15	Observation Port Shutter Secondary Air Shutter	460-039-867 460-039-898
16 17	Rear Refractory Back Refractory Pin Refractory Blanket 268V/368V 468V 568V 668V 768V	591-000-060 591-000-054 591-221-235 591-221-230 591-221-231 591-221-232 591-221-233
18	Vertical Flue Collector 268V/368V 468V 568V 668V 768V	450-020-100 450-020-101 450-020-102 450-020-103 450-020-104
19	Return Pipe Manifold	591-124-002